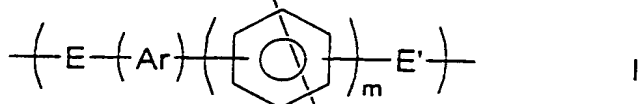
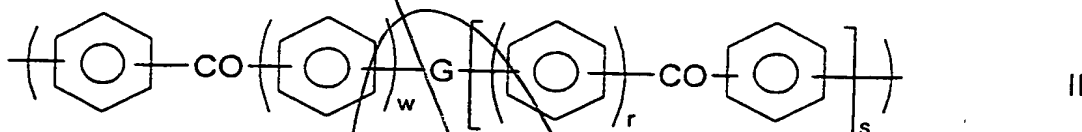


CLAIMS

1. A polymer electrolyte membrane which includes a
5 polymer having a moiety of formula



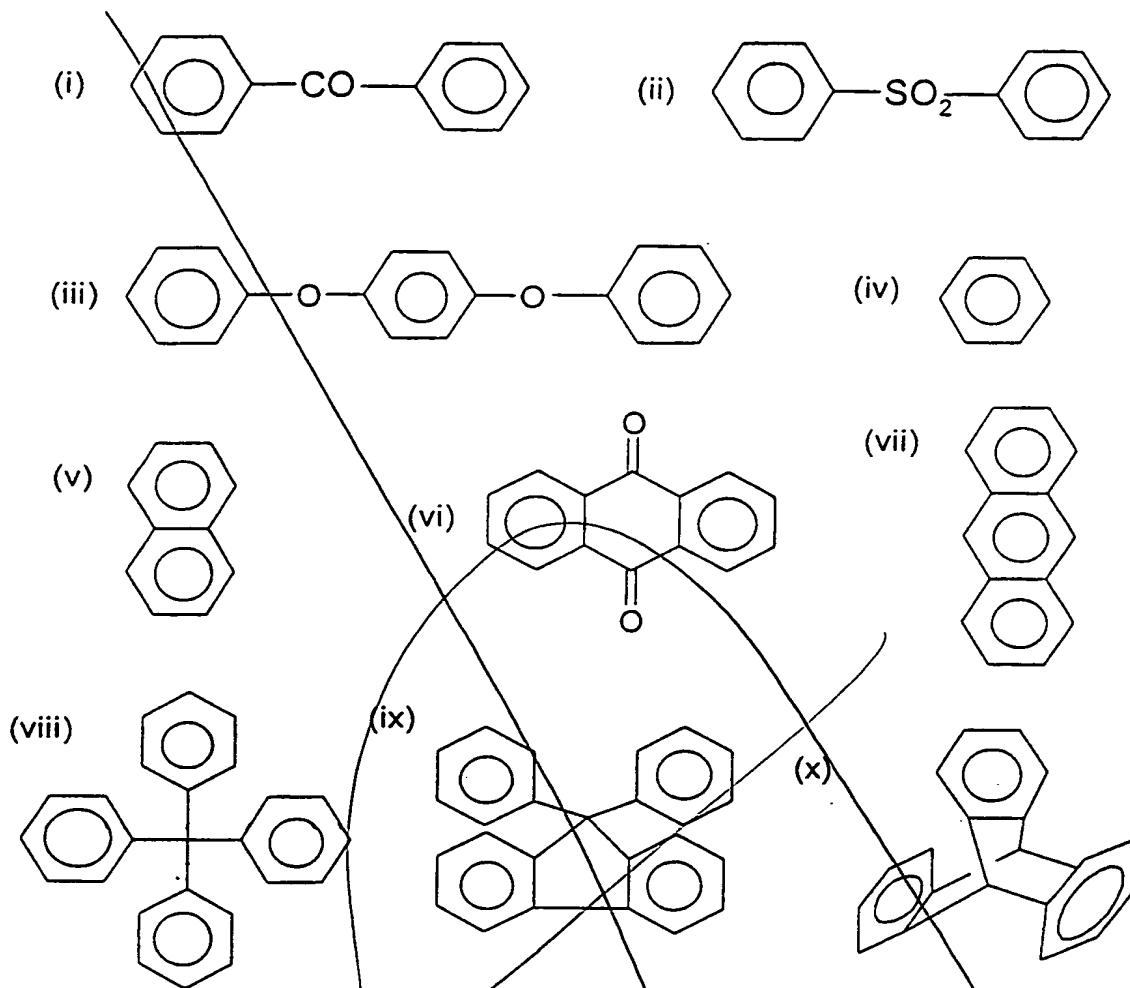
and/or a moiety of formula



10 and/or a moiety of formula



wherein at least some of the units I, II, and/or III are sulphonated; wherein the phenyl moieties in units I, II and III are independently optionally substituted and
15 optionally cross-linked; and wherein m, r, s, t, v, w and z independently represent zero or a positive integer, E and E' independently represent an oxygen or a sulphur atom or a direct link, G represents an oxygen or a sulphur atom, a direct link or a -O-Ph-O- moiety where Ph represents a
20 phenyl group and Ar is selected from one of the following moieties (i) to (x) which is bonded via one or more of its phenyl moieties to adjacent moieties



2. A polymer electrolyte membrane which includes a polymer having a moiety of formula I and/or a moiety of formula II and/or a moiety of formula III as described in claim 1, wherein at least some of units I, II and/or III are functionalized to provide ion exchange sites.

3. A membrane according to claim 1 or claim 2, wherein said polymer is crystalline.

4. A membrane according to any preceding claim, wherein "a" represents the mole % of units of formula I in said

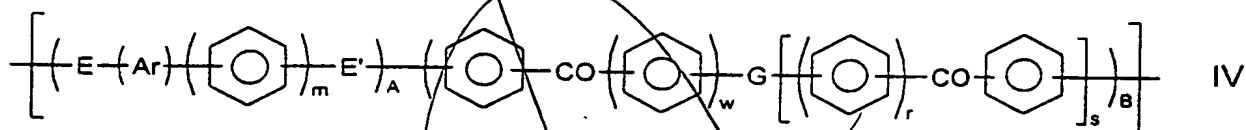
polymer; "b" represents the mole % of units of formula II in said polymer; and "c" represents the mole % of units of formula III in said polymer and wherein a is in the range 45-100 and the sum of b and c is in the range of 0-55.

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5. A membrane according to any preceding claim, wherein said polymer consists essentially of moieties I, II and/or III.

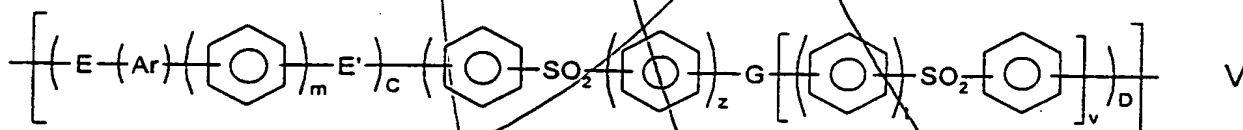
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6. A membrane according to any preceding claim, wherein said polymer is a homopolymer having a repeat unit of general formula



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or a homopolymer having a repeat unit of general formula



or a random or block copolymer of at least two different units of IV and/or V

20

wherein A, B, C and D independently represent 0 or 1.

7. A membrane according to claim 6, wherein said polymer includes at least one repeat unit of formula IV.

25

8. A membrane according to claim 6, wherein said polymer is a copolymer comprising a first repeat unit of formula

IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m represents 1, w represents 1, s represents zero, A and B represent 1; and

5

a second repeat unit of formula V wherein E and E' represent oxygen atoms, Ar represents a structure (i), m represents 0, C represents 1, z represents 1, G represents a direct link, v represents 0 and D represents 1.

10

9. A membrane according to claim 6, wherein said polymer is a copolymer comprising a first repeat unit of formula IV, wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m represents 1, w represents 1, s represents 0, A and B represent 1.

10. A membrane according to claim 6, wherein said polymer is a copolymer comprising a first repeat unit of formula IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m represents 1, w represents 1, s represents 0, A and B represent 1; and a second repeat unit of formula IV wherein E represents an oxygen atom, E' represents a direct link, Ar represents a moiety of structure (i), m represents zero, A represents 1, B represents 0.

11. A membrane according to claim 6, wherein said polymer is a copolymer comprising a first repeat unit which is either:

30

(a') of formula IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a

moiety of structure (iv), m and s represent zero, w represents 1 and A and B represent 1; or

(b') of formula IV wherein E represents an oxygen atom, E' represents a direct link, Ar represents a moiety of structure (i), m represents zero, A represents 1, B represents zero;

and a second repeat unit which is either:

(c') of formula IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m represents 1, w represents 1, s represents zero, A and B represent 1; or

(d') of formula IV wherein E represents an oxygen atom, E' is a direct link, G represents a direct link, Ar represents a moiety of structure (iv), m and s represent zero, w represents 1, A and B represent 1.

12. A membrane according to claim 11, wherein said polymer has a repeat unit as described in paragraph (a') or (b') in combination with a repeat unit as described in paragraph (c').

13. A membrane according to claim 6, comprising a first repeat unit which is selected from the following:

(a) a unit of formula IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m and s represent zero, w represents 1 and A and B represent 1;

(b) a unit of formula IV wherein E represents an oxygen atom, E' represents a direct link, Ar represents a moiety of structure (i), m represents zero, A represents 1, B represents zero;

(c) a unit of formula V wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m and v represent zero, z represents 1 and C and D represent 1;

(d) a unit of formula V wherein E represents an oxygen atom, E' represents a direct link, Ar represents a moiety of structure (ii), m represents 0, C represents 1, D represents 0; or

(e) a unit of formula V wherein E and E' represents an oxygen atom, Ar represents a structure (i), m represents 0, C represents 1, Z represents 1, G represents a direct link, v represents 0 and D represents 1;

and a second repeat unit which is selected from the following:

(f) a unit of formula IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m represents 1, w represents 1, s represents zero, A and B represent 1;

(g) a unit of formula IV wherein E represents an oxygen atom, E' is a direct link, G represents a direct link, Ar represents a moiety of structure (iv), m and s represent zero, w represent 1, A and B represent 1;

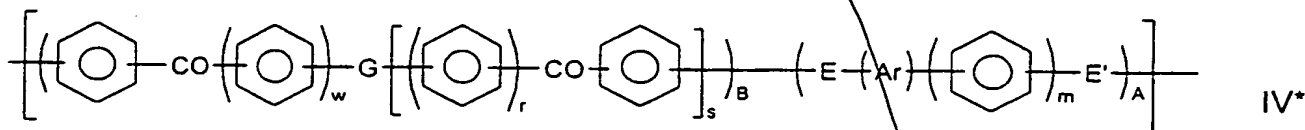
(h) a unit of formula V wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (iv), m represents 1, z represents 1, v represents 0, C and D represent 1; and

(i) a unit of formula V wherein E represents an oxygen atom, E' represents a direct link, G represents a direct link, Ar represents a moiety of structure (iv), m and v represent zero, z represents 1, C and D represent 1;

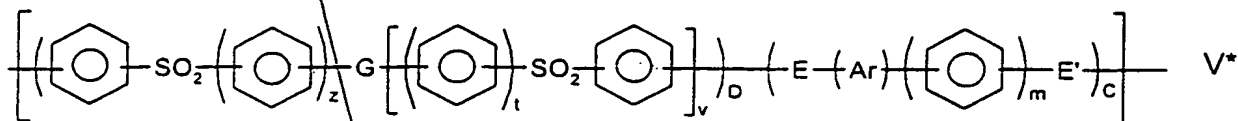
14. A membrane according to any of claims 6 to 13, wherein said second unit is selected from a unit of formula IV wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (v), m represents 0, w represents 1, s represents 0, A and B represent 1; or a unit of formula V wherein E and E' represent oxygen atoms, G represents a direct link, Ar represents a moiety of structure (v), m represents 0, z represents 1, v represents 0, c and d represent 1.

15. A membrane according to claim 13 or claim 14, wherein said copolymer has a first repeat unit selected from units (b), (d) or (e) in combination with a second repeat unit selected from units (f) or (h).

16. A membrane according to any of claims 1 to 5, wherein said polymer is a homopolymer having a repeat unit of general formula



or a homopolymer having a repeat unit of general formula



5 or a random or block copolymer of at least two different units of IV* and/or V* wherein A, B, C and D independently represent 0 or 1.

17. A membrane according to claim 16, wherein said
10 polymer includes: a repeat unit of formula IV* wherein E represents a direct link, E' represents an oxygen atom, G represents a direct link, w, s and m represent 0, A and B represent 1; and/or a repeat unit of formula V* wherein E represents a direct link, E' represents an oxygen atom, G
15 represents a direct link, z, v and m represent 0, C and D represent 1.

18. A membrane according to claim 17 which includes a repeat unit of formula IV* or V* and any of units (a) to
20 (i) according to claim 13.

19. A membrane according to any preceding claim, wherein said polymer includes at least some ketone moieties in the polymeric chain.

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20. A membrane according to any preceding claim, wherein said polymer includes a biphenylene moiety.

21. A membrane according to any preceding claim, wherein said polymer includes a -O-biphenylene-O- moiety.

22. A membrane according to any preceding claim, wherein
5 said polymer includes a -O-naphthalene-O-moiety.

23. A membrane according to any preceding claim, wherein said polymer has a glass transition temperature (T_g) of at least 144°C.

24. A membrane according to claim 23, wherein said glass transition temperature is at least 154°C.

25. A membrane according to any preceding claim, wherein
15 said polymer has an inherent viscosity of at least 0.3.

26. A membrane according to any preceding claim, for a fuel cell.

20 27. A membrane according to any preceding claim, for an
electrolyser.

28. A fuel cell incorporating a polymer electrolyte membrane according to any of claims 1 to 25.

29. An electrolyser incorporating a polymer electrolyte membrane according to any of claims 1 to 25.

30. A gas diffusion electrode incorporating a polymer
30 electrolyte membrane according to any of claims 1 to 25.

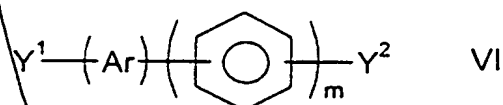
31. A novel polymer as described in any of claims 1 to 25
per se.

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32. A process for the preparation of a polymer as described in any of claims 1 to 25, the process comprising:

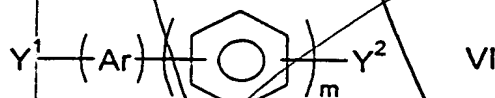
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(a) polycondensing a compound of general formula



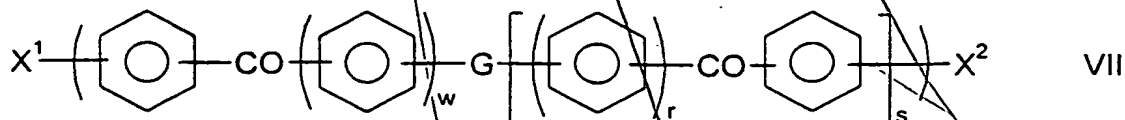
with itself wherein Y^1 represents a halogen atom or a group -EH and Y^2 represents a halogen atom or, if Y^1 represents a halogen atom, Y^2 represents a group E'H; or

(b) polycondensing a compound of general formula

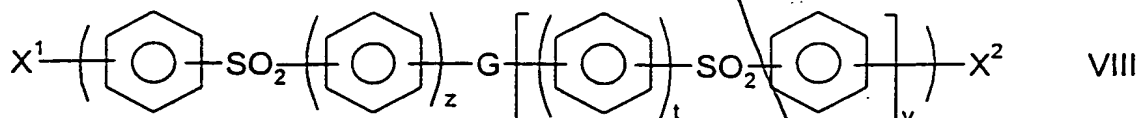


15

with a compound of formula



and/or with a compound of formula



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[Signature]